



Photo by B. Hatchett

Quarterly Report and Outlook

Informe Trimestral y Pronóstico en línea

www.unr.edu/climate/climate-summary

October - December 2016

Notable Weather and Climate in Nevada



Temperatures across the state were slightly warmer than the long-term October - December average, with some variability by month. November was warmer than normal, while December was a bit cooler than normal in northern Nevada. Overall, an unremarkable fall, temperature wise.

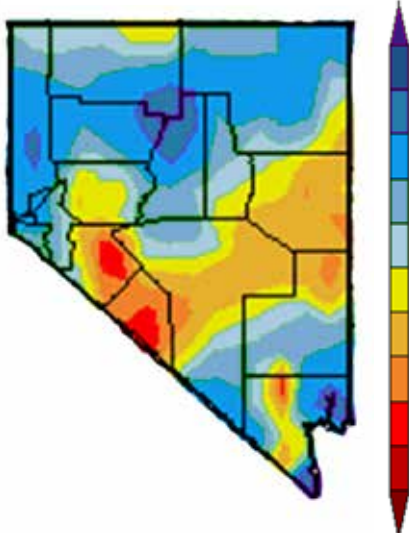
Mineral, Esmerelda, White Pine and parts of Nye counties were dry this fall. North and south of that band, however, were quite wet. In northern Nevada, this is due to wet conditions in both October and December. Indeed 17 stations set or tied precipitation records for October. Some stations even set maximum 1- and 3-day precipitation totals during a mid-month storm. Southern Nevada saw wet conditions in December, with some locations receiving more than twice the normal precipitation.

This has left us with end-of-2016 snow water equivalents that were generally above normal for this time of year in the northeast, Utah and in and the Upper Colorado Basin, and just below normal in the Sierra Nevada.

High winds ahead of the mid-October storm that brought so much precipitation to the northern part of the state also fanned a wildfire near Carson City that damaged a number of homes.

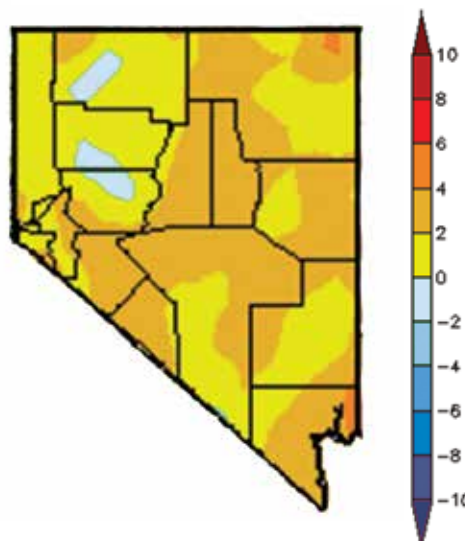
- Wildfire
- Thunderstorms and heavy rain
- Drought impacts

October - December Precipitation
Percent of Normal

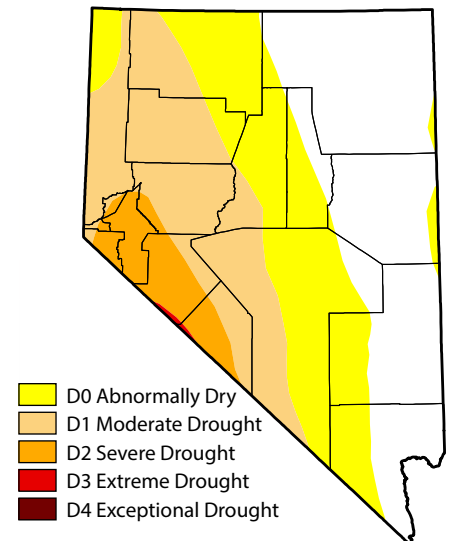


<http://www.nprcc.unl.edu/maps.php?map=ACISClimateMaps#>

October - December Temperature
Difference from Normal



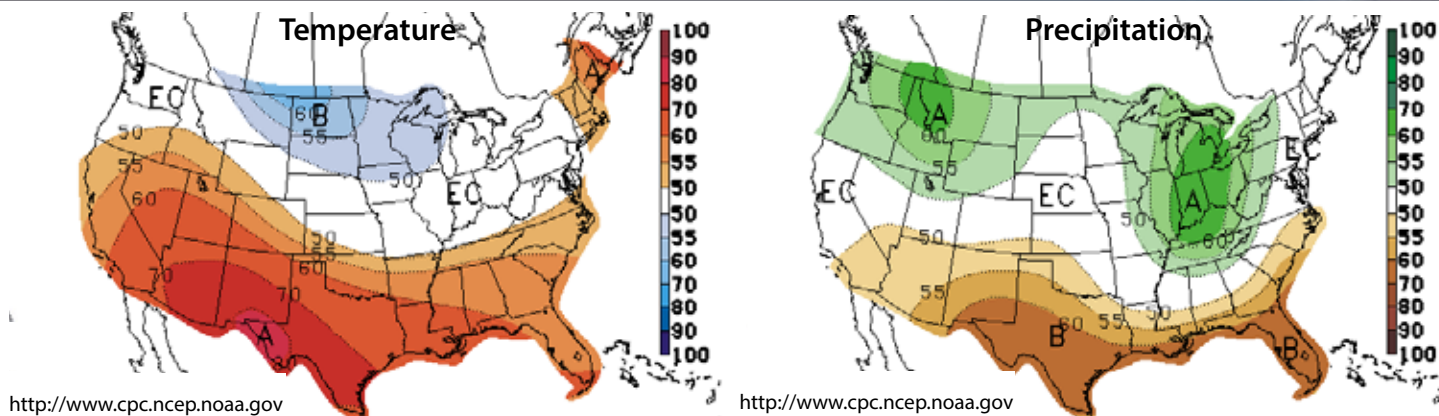
January 3 Drought Monitor



- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

<http://droughtmonitor.unl.edu>

Three-month outlook



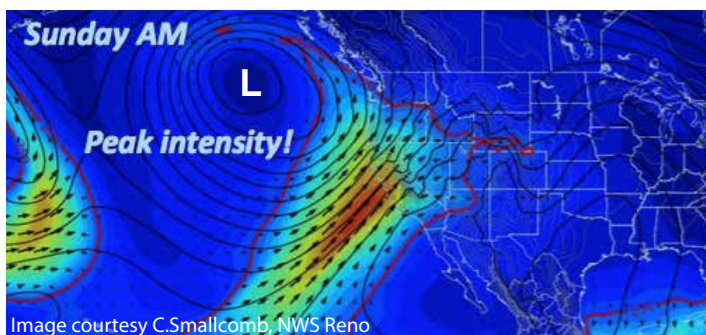
Depending on where you live in Nevada, there is 50 to nearly 70% chance that the coming three months will be warmer than normal. Clark county, along with the southern parts of Nye and Lincoln counties, have a slightly elevated risk of drier than normal conditions throughout the winter, while a sliver of northern and northeastern Nevada have just over a 50% chance for a wetter than normal winter. These forecasts are consistent with the relatively weak La Niña conditions in the tropical Pacific. California and the Upper Colorado River Basin -- significant water sources for Nevada's urban regions -- are not at particularly high risk for a dry winter with equal chances (EC) of above and below normal precipitation, but are likely to be warmer than normal, which can lead to lower April 1 snowpacks, even if precipitation is at or above normal.

In depth

Atmospheric Rivers

Climatologists and meteorologists use the term *atmospheric river (AR)* to refer to a long, often relatively narrow band of moisture within the atmosphere. These ARs transport large amounts of moisture out of the subtropics and into the mid-latitudes, mostly during the late fall and winter.

The image below is from the Reno National Weather Service Forecast Office, and it shows a major AR impacting the West Coast. Colors in the image show integrated vapor transport (basically the amount of moisture in the atmosphere multiplied by the wind speed and direction), with yellow, orange and red showing areas where a lot of moisture is being transported and arrows showing the direction moisture is moving. Black lines show pressure in the atmosphere. Counter-clockwise circulation around the low centered off Vancouver Island pulls warm, moist air up from just east of Hawaii. When



that moisture reaches California, it can feed heavy rain or snow.

Atmospheric rivers aren't just cool storms that weather weenies get excited about, though. These very wet, usually warm storms that last 8 - 24 hours provide 10% of winter precipitation in central and northeastern Nevada, about 30% in the far south, and up to 50% along the border with northern California. Because of how much moisture ARs transport, they can trigger very heavy precipitation. That precipitation is also likely to arrive as very wet snow or rain, even at high elevations, because of the warmth of that subtropical air.

Atmospheric rivers are an important source of winter precipitation for much of Nevada, and they are even more important in the Sierra. On the other hand, major ARs often cause flooding, particularly if they occur when there's already a significant snowpack in the mountains, can trigger landslides on recently burned slopes, and can increase avalanche risks in the mountains. So next time there's an AR, be thankful for the moisture, but stay tuned to the forecast so you're aware of the risks.

Think this AR stuff is cool? Check out the papers by Dettinger and other (2012) in *Natural Hazards* and by Rutz and others (2014) in *Monthly Weather Review* that I referred to for details. You can also head over to <https://pubs.usgs.gov/of/2010/1312/> to see what researchers and emergency managers anticipate happening if two huge ARs were to hit the region back-to-back.